Check List the journal of biodiversity data

NOTES ON GEOGRAPHIC DISTRIBUTION

Check List 16 (2): 423–433
https://doi.org/10.15560/16.2.423

PENSOFT

Updated distribution maps with new records of *Trilepida fuliginosa* (Passos, Caramaschi & Pinto, 2006) and *Drepanoides anomalus* (Jan, 1863) (Squamata, Serpentes) in the state of Maranhão, northeastern Brazil

Thaís B. Guedes[1,2], Aryel Queiroz[1], Patrícia Sousa[1], Breno Hamdan[3]

1 Universidade Estadual do Maranhão, Centro de Estudos Superiores de Caxias, Programa de Pós-Graduação em Biodiversidade, Ambiente e Saúde, Praça Duque de Caxias s/n, Morro do Alecrim, 65604-380, Caxias, Maranhão, Brazil. **2** Gothenburg Global Biodiversity Center, University of Gothenburg, Department of Biological and Environmental Sciences, Box 461, SE-405 30, Göteborg, Sweden. **3** Instituto Vital Brazil, Laboratório de Coleções Biológicas e Biodiversidade, 24230-410, Niterói, RJ, Brazil.
Corresponding author: Thaís Guedes, thaisbguedes@yahoo.com.br

Abstract

We report for the first time *Trilepida fuliginosa* (Passos, Caramaschi & Pinto, 2006) and *Drepanoides anomalus* (Jan, 1863) in the state of Maranhão, Brazil. Our record for *T. fuliginosa* represents the northernmost locality for the species and extends its geographic distribution by nearly 662 km (in a straight line) from São Geraldo do Araguaia, state of Pará. Our record for *D. anomalus* is the easternmost known occurrence and extends its distribution by 203 km from Piçarra, Pará. Updated distribution maps and images of preserved specimens are provided.

Keywords

Ecoregions, range extension, South America.

Academic editor: Josué Anderson Rêgo Azevedo | Received 1 January 2020 | Accepted 16 March 2020 | Published 10 April 2020

Citation: Guedes TB, Queiroz A, Sousa P, Hamdan B (2020) Updated distribution maps with new records of *Trilepida fuliginosa* (Passos, Caramaschi & Pinto, 2006) and *Drepanoides anomalus* (Jan, 1863) (Squamata, Serpentes) in the state of Maranhão, northeastern Brazil. Check List 16 (2): 423–433. https://doi.org/10.15560/16.2.423

Introduction

The Brazilian state of Maranhão is in the north-central part of the country and has a vast area of over 329,000 km^2 (IBGE 2019a). Maranhão has a wide variety of geomorphological formations, soil types, altitudinal gradients, and climates which result in a high heterogeneity of phytophysiognomies (Ab'Saber 1960). Within the state five ecoregions are recognized: Cerrado Savannas, Tocantins Pindaré Moist Forest, Amazon-Orinoco-Southern Caribbean mangroves, Northeast Brazil Restingas, and Maranhão Babaçu Forests (Dinerstein et al. 2017); the last one is recognized as a world biodiversity hotspot (Myer et al. 2000; Mittermeier et al. 2005). Although Maranhão is known for its rich biodiversity, there are very few researchers in the state, which results in a huge knowledge gap in the composition and distribution of its biodiversity (Martins and Oliveira 2011; Barros 2012; Freitas et al. 2017; Guedes et al. 2018).

Only a few studies have been published on squamate reptiles of Maranhão. Most are inventories that focus especially on Amazonia in the northwestern part of the

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state (e.g. Barreto et al. 2011; Miranda et al. 2012; Freitas et al. 2017), while others studies conducted in large scale and more general also provided some species composition data for the state (e.g. Cunha and Nascimento 1993; Avila-Pires 1995; Guedes et al. 2014a, 2014b, 2018; Ribeiro-Júnior 2015a, 2015b, 2016, 2017). To fill knowledge gaps of species compositions and distributions of the snakes of Maranhão, we provide new records for two snake species—*Trilepida fuliginosa* (Passos, Caramaschi & Pinto, 2006) and *Drepanoides anomalus* (Jan, 1863).

Trilepida fuliginosa (Leptotyphlopidae) is a small threadsnake (maximum total length 303 mm) described from the holotype and 41 paratypes. It is distinguished from other species of *Trilepida* in having the rostral shape subtriangular in dorsal view, the naris located at pupil level, a uniformly dark brown dorsal color pattern, 198–218 middorsal scales, and 14–20 subcaudal scales (Passos et al. 2006). This species is fossorial, and much of what is known about its distribution came from the material collected during the implementation of three hydroelectric plants (Queimados, Luiz Eduardo Magalhães, and Serra da Mesa) in the states of Minas Gerais, Goiás, and Tocantins. To date, *T. fuliginosa* is known to occur at only nine localities in the northern and central Brazilian Cerrado, from the eastern of Minas Gerais to the central region of Tocantins (Passos et al. 2006).

Drepanoides anomalus (Dipsadidae) is a medium-sized (maximum total 837 mm) terrestrial snake (Cunha and Nascimento 1978, 1993; Martins and Oliveira 1998). It is distinguished from other species in having 15 dorsal scales without reduction, no loreal plate, no tooth on the maxillary and either with a groove or a closed canal, the temporals present, the vertebral and paravertebral scales almost equal in size, the anal scale single, 162–180 ventrals, 74–82 subcaudals, a bright coral-red dorsum with a black tip on each scale, the head and anterior portion of the neck grayish black, and the venter unspotted (Peters and Orejas-Miranda 1970; Cunha and Nascimento 1978, 1993). Although considered rare, this species is widely distributed in the Amazon Rainforest and has been recorded in southern Guyana, eastern Ecuador and Peru, northern Bolivia, and Brazil, where it occurs in the states of Acre, Rondônia, Amazonas, Pará, Roraima, Amapá, and Mato Grosso (Costa and Bérnils 2018; Nogueira et al. 2019).

We report the first occurrences of *Trilepida fuliginosa* and *Drepanoides anomalus* for the state of Maranhão, Brazil. The new data are based on specimens examined in the herpetological collection of the Museu Paraense Emílio Goeldi during the development of the project "Unveiling the high diversity of the snakes of the Mid-North Region of Brazil", led by TBG." Along with the new records, we also present updated maps of geographic distribution considering the literature data available (Table 1).

Methods

We found specimens of *Trilepida fuliginosa* and *Drepanoides anomalus* deposited in the herpetological collection of Museu Paraense Emílio Goeldi (MPEG; Belém, Pará). We carefully examined the specimens and measured snout vent length (SVL), tail length (CL), and total length (TL) using a tape measure in millimeters. For *T. fuliginosa*, we followed Lehr et al. (2002) for scale features and measurements, and Wallach (2003) for terminology of cephalic shields. For *D. anomalus*, we counted ventral and subcaudal scales following Dowling (1951). We took high-resolution photographs of specimens of both species in dorsal and ventral views of the body, as well as dorsal, ventral, and lateral views of the head.

We reviewed the literature for occurrence records of both species in South America. Updated distribution maps for each species were drawn using QGIS v. 2.14.

Results

***Trilepida fuliginosa* (Passos, Caramaschi & Pinto, 2006)**

Figures 1, 2

New record. Material examined. BRAZIL • 1 ♂, 188 mm SVL, 16 mm CL, TL/CL 12.75; state of Maranhão, Urbano Santos, Santo Amaro Farm; 03.2494°S,

Table 1. Literature and herpetological collection data of occurrences of *Trilepida fuliginosa* and *Drepanoides anomalus* in South America. *Prudente et al. (2019) reported an important compilation of museum data. Since we examined only MPEG 21523, and not all specimens of *T. fuliginosa* in Prudente's list, we call attention that these data could hide taxonomic error.

Species	Locality	Latitude	Longitude	Reference
Trilepida fuliginosa	Santo Amaro Farm, municipality of Urbano Santos, state of Maranhão, Brazil	−03.2494°	−043.4164	This study
Trilepida fuliginosa	Hydroeletric Plant of Queimados, between municipalities of Luziânia in the state of Goiás and Unaí in the state of Minas Gerais (type-locality), Brazil	−16.35°	−046.90°	Passos et al. 2006
Trilepida fuliginosa	Hydroeletric Plant of Luiz Eduardo Magalhães, municipality of Lageado, state of Tocantins, Brazil	−09.7254°	−048.3600°	Passos et al. 2006
Trilepida fuliginosa	Municipality of Peixe, state of Tocantins, Brazil	−12.0167°	−048.5333°	Passos et al. 2006
Trilepida fuliginosa	Hydroeletric Plant of Luiz Eduardo Magalhães, municipality of Porto Nacional, state of Tocantins, Brazil	−10.7036°	−048.4163°	Passos et al. 2006
Trilepida fuliginosa	Hydroeletric Plant of Luiz Eduardo Magalhães, municipality of Palmas, state of Tocantins, Brazil	−10.30°	−048.35°	Passos et al. 2006
Trilepida fuliginosa	Hydroeletric Plant of Serra da Mesa, municipality of Minaçu, state of Goiás, Brazil	−13.491°	−048.359°	Passos et al. 2006
Trilepida fuliginosa	Municipality of Paranã, state of Tocantins, Brazil	−12.6000°	−047.8667°	Passos et al. 2006
Trilepida fuliginosa	Hydroeletric Plant of Queimados, between municipalities of Cristalina in the state of Goiás, and Unaí and Cabeceira Grande in the state of Minas Gerais, Brazil	−16.213°	−047.314°	Passos et al. 2006
Trilepida fuliginosa	Serra das Andorinhas, Santa Cruz, municipality of São Geraldo do Araguaia, state of Pará, Brazil	−06.2274°	−048.4440°	Nogueira et al. 2019

Species	Locality	Latitude	Longitude	Reference
Trilepida fuliginosa	Hydroeletric Plant of Estreito, municipality of Carolina, state of Maranhão, Brazil	−07.41°	−047.28°	Prudente et al. 2019*
Trilepida fuliginosa	Hydroeletric Plant of Estreito, municipality of Estreito, state of Maranhão, Brazil	−06.82°	−047.21°	Prudente et al. 2019*
Trilepida fuliginosa	Hydroeletric Plant of Estreito, municipality of Darcinópolis, state of Tocantins, Brazil	−06.775°	−047.752°	Prudente et al. 2019*
Drepanoides anomalus	Hydroeletric Plant of Estreito, municipality of Carolina, Filadelfia village, state of Maranhão, Brazil	−07.41°	−047.28°	This study
Drepanoides anomalus	Cayenne, Guiana Francesa	04.9182°	−052.3191°	Vidal et al. 1998
Drepanoides anomalus	Mana, Guiana Francesa	05.652°	−053.830°	Vidal et al. 1998
Drepanoides anomalus	Dureno, Sucumbios, Ecuador	−00.03°	−076.500°	Duellman 1978
Drepanoides anomalus	Municipality of Bela Vista do Araguaia, state of Pará, Brazil	−01.065°	−046.789°	Cunha and Nascimento 1978
Drepanoides anomalus	Municipality of Benevides, state of Pará, Brazil	−01.361°	−048.245°	Cunha and Nascimento 1993
Drepanoides anomalus	Municipality of Ananindeua, state of Pará, Brazil	−01.366°	−048.372°	Cunha and Nascimento 1978, 1993
Drepanoides anomalus	Municipality of Belém, state of Pará, Brazil	−01.445°	−048.5°	Cunha and Nascimento 1978, 1993
Drepanoides anomalus	Putumayo, Colombia	−00.5154°	−075.9317°	Wallach et al. 2014
Drepanoides anomalus	Beni, Bolivia	−10.8276°	−065.3613°	Fugler et al. 1995
Drepanoides anomalus	La Paz, Bolivia	−16.5053°	−068.1086°	Wallach et al. 2014
Drepanoides anomalus	Morona-Santiago, Ecuador	−02.3051°	−078.1147°	Wallach et al. 2014
Drepanoides anomalus	Napo, Ecuador	−0.9123°	−077.8128°	Wallach et al. 2014
Drepanoides anomalus	Canelos, Pastaza, Ecuador	−1.5898°	−077.7541°	Andrade 2010
Drepanoides anomalus	Juyu Intza, Pastaza, Ecuador	−02.1080°	−076.1885°	Andrade 2010
Drepanoides anomalus	Andoas, Pastaza, Ecuador	−02.5000°	−076.6300°	Andrade 2010
Drepanoides anomalus	Municipality of Manaus, state of Amazonas, Brazil	−03.102°	−060.020°	Martins and Oliveira 1998
Drepanoides anomalus	Municipality of Candeias do Jamari, state of Rondonia, Brazil	−08.780°	−063.702°	Silva Jr. 1993
Drepanoides anomalus	Ucayali, Peru	−10.1030°	−073.8172°	Lehr 2002
Drepanoides anomalus	Municipality of Juara, state Mato Grosso, Brazil	−10.3450°	−057.6722°	Ávila and Kawashita-Ribeiro 2011
Drepanoides anomalus	Parque Estadual do Utinga, municipality of Belém, state of Pará, Brazil	−01.4265°	−048.4274°	Cunha and Nascimento 1978; Avila-Pires et al. 2018
Drepanoides anomalus	Municipality of Guajará-Mirim, state of Rondônia, Brazil	−10.7621°	−065.3128°	Bernarde et al. 2012; Ávila-Pires et al. 2009
Drepanoides anomalus	Extrativist Reserve Ituxi, state of Amazonas, Brazil	−08.3300°	−065.7167°	Ávila-Pires et al. 2009
Drepanoides anomalus	Municipality of Vilhena, state of Rondônia, Brazil	−12.7501°	−060.1272°	Bernarde et al. 2012
Drepanoides anomalus	Municipality of Espigão do Oeste, state of Rondônia, Brazil	−11.5000°	−060.6667°	Bernarde and Abe 2006
Drepanoides anomalus	Municipality of Pimenta Bueno, state of Rondônia, Brazil	−11.673°	−061.193°	Yuki et al. 1999
Drepanoides anomalus	Municipality of Porto Velho, state of Rondônia, Brazil	−08.7320°	−063.9002°	Bernarde et al. 2012
Drepanoides anomalus	Municipality of São Miguel do Guaporé, state of Rondônia, Brazil	−11.505°	−063.580°	Vanzolini 1986
Drepanoides anomalus	Municipality of Cacoal, state of Rondônia, Brazil	−11.4274°	−061.4674°	Turci and Bernarde 2008
Drepanoides anomalus	Forest of Moa River, municipality of Cruzeiro do Sul, state of Acre, Brazil	−07.6233°	−072.7953°	Bernarde et al. 2013
Drepanoides anomalus	Riozinho da Liberdade Extractive reserve, municipality of Tarauaca, state of Acre, Brazil	−07.9556°	−072.0769°	Bernarde et al. 2011
Drepanoides anomalus	Manu National Park, Peru	−12.0606°	−071.8645°	Catenazzi et al. 2013
Drepanoides anomalus	La Paz, Sorata, Bolivia	−15.7833°	−068.6667°	Fugler et al. 1995
Drepanoides anomalus	Scheffer Farm, Ituxi river, state of Amazonas, Brazil	−08.1159°	−065.4300°	Avila-Pires et al. 2009
Drepanoides anomalus	Kaw Mountain, Guiana Francesa	−04.5512°	−052.1525°	Vacher et al. 2002
Drepanoides anomalus	Crique Gabaré, Guiana Francesa	−03.9083°	−051.8158°	Vacher et al. 2002
Drepanoides anomalus	Cachimbo Range, municipality of Novo Progresso, state of Pará, Brazil	−08.9186°	−055.8350°	Franca et al. 2006
Drepanoides anomalus	Las Piedras Province, Peru	−12.0560°	−069.6598°	Crnobrna, et al 2016
Drepanoides anomalus	Municipality of Porto Walter, state of Acre, Brazil	−08.2973°	−072.8508°	Fonseca et al. 2019
Drepanoides anomalus	Hydroeletric Plant of Santo Antônio, Madeira River, state of Rondônia, Brazil	−08.8507°	−064.0125°	Fraga et al. 2014; Marçal et al. 2011
Drepanoides anomalus	National Forest of Caxiuanã, municipality of Melgaço, state of Pará, Brazil	−01.804°	−050.712°	Santos-Costa et al. 2015
Drepanoides anomalus	Municipality of Cruzeiro do Sul, state of Acre, Brazil	−07.6623°	−072.6843°	Silva et al. 2010
Drepanoides anomalus	Província Petrolífera de Urucu, municipality of Coari, state of Amazonas, Brazil	−04.8853°	−065.3498°	Prudente et al. 2010
Drepanoides anomalus	National Forest of Saracá-Taquera, state of Pará, Brazil	−01.6537°	−056.6306°	Morato et al. 2014
Drepanoides anomalus	National Forest of Trairão, state of Pará, Brazil	−04.5758°	−055.4039°	Mendes-Pinto et al. 2011
Drepanoides anomalus	Northwestern limit of Amazonica Basin, Guiana	−60.5679°	−060.7507°	Hoogmoed 1982
Drepanoides anomalus	Cuzco Amazonico, Madri de Dios, Peru	−11.6797°	−070.5852°	Duellman and Salas1991
Drepanoides anomalus	Paramaribo, Surinam	05.800°	−056.2044°	Nogueira et al. 2019
Drepanoides anomalus	Plantation Peperpot, Surinam	05.7667°	−055.1331°	Nogueira et al. 2019
Drepanoides anomalus	New River, Surinam	01.9330°	−056.6264°	Nogueira et al. 2019
Drepanoides anomalus	National Park Virua, state of Roraima, Brazil	01.2793°	−060.9889°	Nogueira et al. 2019
Drepanoides anomalus	Cucui, state of Amazonas, Brazil	01.1985°	−066.8355°	Nogueira et al. 2019
Drepanoides anomalus	Serra do Navio, state of Amapá, Brazil	00.896°	−052.002°	Nogueira et al. 2019
Drepanoides anomalus	Municipality of São Gabriel da Cachoeira, state of Amazonas, Brazil	00.136°	−067.097°	Nogueira et al. 2019
Drepanoides anomalus	Municipality of Santa Isabel, state of Amazonas, Brazil	00.1263°	−068.9474°	Nogueira et al. 2019

Species	Locality	Latitude	Longitude	Reference
Drepanoides anomalus	Reserva de Produccion Faunistica Cuyabeno, Estacion Cientifica (PUCE), Sucumbios, Ecuador	−00.001°	−076.175°	Nogueira et al. 2019
Drepanoides anomalus	Coop Los Angeles, Sucumbios, Ecuador	−00.0266°	−077.1060°	Nogueira et al. 2019
Drepanoides anomalus	Puerto Rodrigues, Putumayo, Ecuador	−00.742°	−075.452°	Nogueira et al. 2019
Drepanoides anomalus	Parroq. San Sebastian de Coca, Comuna Juan Pablo II, Rio Punino, Orellana, Ecuador	−00.278°	−077.340°	Nogueira et al. 2019
Drepanoides anomalus	Parque Nacional Yasuni, Orellana, Ecuador	−00.473°	−076.575°	Nogueira et al. 2019
Drepanoides anomalus	Taracoa, Orellana, Ecuador	−00.490°	−076.772°	Nogueira et al. 2019
Drepanoides anomalus	Bosque Aluvial, Comunidad de Guiyero, Ecuador	−00.6246°	−076.4944°	Nogueira et al. 2019
Drepanoides anomalus	Parque Nacional Yasuni, Napo, Ecuador	−00.654°	−076.452°	Nogueira et al. 2019
Drepanoides anomalus	Municipality of Cachoeira do Ararí, state of Pará, Brazil	−01.0114°	−048.9633°	Nogueira et al. 2019
Drepanoides anomalus	Municipality of Viseu, state of Pará, Brazil	−01.1967°	−046.1400°	Nogueira et al. 2019
Drepanoides anomalus	Municipality of Santa Luzia do Pará, state of Pará, Brazil	−01.202°	−046.143°	Nogueira et al. 2019
Drepanoides anomalus	Tiguno River, Bataburo Lodge, Pastaza, Ecuador	−01.250°	−076.666°	Nogueira et al. 2019
Drepanoides anomalus	Vall-de-Caes, Marex, municipality of Belém, state of Pará, Brazil	−01.3838°	−048.4835°	Nogueira et al. 2019
Drepanoides anomalus	Alrededores de Villano, Comunidad Tarangaro, Unidad 1, Pastaza, Ecuador	−01.394°	−077.382°	Nogueira et al. 2019
Drepanoides anomalus	Alrededores de Villano, Comunidad Tarangaro, Unidad 2, Pastaza, Ecuador	−01.394°	−077.385°	Nogueira et al. 2019
Drepanoides anomalus	Alrededores de Villano, Campamento Petrolero de AGIP, Villano B Sendero Tuberias, pastaza, Ecuador	−01.452°	−077.442°	Nogueira et al. 2019
Drepanoides anomalus	Alrededor de Villano, campamento Petrolero de AGIP, Villano B-II, cerca de la Unidad 1, Pastaza, Ecuador	−01.454°	−077.441°	Nogueira et al. 2019
Drepanoides anomalus	Campus of research MPEG, municipality of Belém, state of Pará, Brazil	−01.4619°	−048.4599°	Nogueira et al. 2019
Drepanoides anomalus	Alrededores de Villano, Campamento petrolero AGIP, K10 Unidad 1, Pastaza, Ecuador	−01.476°	−077.532°	Nogueira et al. 2019
Drepanoides anomalus	Porto Trombetas, municipality of Oriximiná, state of Pará, Brazil	−01.4833°	−056.3833°	Nogueira et al. 2019
Drepanoides anomalus	Municipality of Melgaço, state of Pará, Brazil	−01.8044°	−050.7122°	Nogueira et al. 2019
Drepanoides anomalus	Enseada, municipality of São João de Pracajuba, state of Pará, Brazil	−01.8167°	−051.333°	Nogueira et al. 2019
Drepanoides anomalus	Caquajo, municipality of São João de Pracajuba, state of Pará, Brazil	−01.9167°	−051.3833°	Nogueira et al. 2019
Drepanoides anomalus	Mojuá, municipality of São João de Pracajuba, state of Pará, Brazil	−01.9167°	−051.3833°	Nogueira et al. 2019
Drepanoides anomalus	Municipality of Portel, state of Pará, Brazil	−01.9428°	−050.8211°	Nogueira et al. 2019
Drepanoides anomalus	Montalvo (Andoas), Pastaza, Ecuador	−02.100°	−076.248°	Nogueira et al. 2019
Drepanoides anomalus	Municipality of Juruti, state of Pará, Brazil	−02.1522°	−056.0922°	Nogueira et al. 2019
Drepanoides anomalus	Municipality of Novo Airão, state of Amazonas, Brazil	−02.6333°	−060.9333°	Nogueira et al. 2019
Drepanoides anomalus	Municipality of Vitória do Xingú, state of Pará, Brazil	−02.8667°	−052.0000°	Nogueira et al. 2019
Drepanoides anomalus	Gral. Leonidas Plaza Gutierrez (Limon), Napinaza, Quebrada rio NapinazaMorona Santiago, Ecuador	−02.922°	−078.407°	Nogueira et al. 2019
Drepanoides anomalus	Municipality of Careiro da Varzea, state of Amazonas, Brazil	−03.221°	−059.826°	Nogueira et al. 2019
Drepanoides anomalus	Municipality of Tucurui, state of Pará, Brazil	−03.7661°	−049.6725°	Nogueira et al. 2019
Drepanoides anomalus	Municipality of Coari, state of Amazonas, Brazil	−04.085°	−063.141°	Nogueira et al. 2019
Drepanoides anomalus	Municipality of Porto Urucu, state of Amazonas, Brazil	−04.0850°	−063.1414°	Nogueira et al. 2019
Drepanoides anomalus	Municipality of Itaituba, state of Pará, Brazil	−04.2761°	−055.9836°	Nogueira et al. 2019
Drepanoides anomalus	Resex Rio Iriri, Roncador, state of Pará, Brazil	−04.4369°	−053.6790°	Nogueira et al. 2019
Drepanoides anomalus	Flona do Trairão, municipality of Ruropolis, state of Pará, Brazil	−04.5756°	−055.4037°	Nogueira et al. 2019
Drepanoides anomalus	Flona do Tapirape Aquiri, municipality of Marabá, state of Pará, Brazil	−05.5829°	−050.3996°	Nogueira et al. 2019
Drepanoides anomalus	Municipality of Parauapebas, state of Pará, Brazil	−06.0667°	−049.9000°	Nogueira et al. 2019
Drepanoides anomalus	Pera Dam, municipality of Carajás, state of Pará, Brazil	−06.0675°	−049.9022°	Nogueira et al. 2019
Drepanoides anomalus	Municipality of Piaçarra, state of Pará, Brazil	−06.4333°	−048.8667°	Nogueira et al. 2019
Drepanoides anomalus	Municipality of Novo Aripuana, state of Amazonas, Brazil	−06.744°	−060.461°	Nogueira et al. 2019
Drepanoides anomalus	Resex Canutama, municipality of Canutama, state of Amazonas, Brazil	−06.8213°	−064.6728°	Nogueira et al. 2019
Drepanoides anomalus	Vila Ecológica Céu do Juruá, municipality of Ipixuna, state of Amazonas, Brazil	−06.8667°	−071.2000°	Nogueira et al. 2019
Drepanoides anomalus	Municipality of Novo Progresso	−07.1478°	−055.3811°	Nogueira et al. 2019
Drepanoides anomalus	Municiaplity of Labrea, state of Amazonas, Brazil	−07.259°	−064.799°	Nogueira et al. 2019
Drepanoides anomalus	Ituxi River, state of Amazonas, Brazil	−07.5368°	−066.3794°	Nogueira et al. 2019
Drepanoides anomalus	Madeira River, village of Mutum, state of Amazonas, Brazil	−08.5681°	−063.6850°	Nogueira et al. 2019
Drepanoides anomalus	Municipality of Apiacas, state of Mato Grosso, Brazil	−08.7529°	−057.8272°	Nogueira et al. 2019
Drepanoides anomalus	Jamari River, municipality of Porto Velho, state of Roraima, Brazil	−08.762°	−063.904°	Nogueira et al. 2019
Drepanoides anomalus	Hydroeletric Plant of Jirau, municipality of Porto Velho, state of Roraima, Brazil	−09.3311°	−064.7344°	Nogueira et al. 2019
Drepanoides anomalus	Municipality of Jacareacanga, state of Pará, Brazil	−09.3667°	−056.7167°	Nogueira et al. 2019
Drepanoides anomalus	Municipality of Cotriguaçu, state of Mato Grosso, Brazil	−09.5141°	−058.6786°	Nogueira et al. 2019
Drepanoides anomalus	Municipality of Alta Floresta, Mato Grosso, Brazil	−09.8756°	−056.0861°	Nogueira et al. 2019
Drepanoides anomalus	Parque Estadual Guajara-Mirirm, state of Roraima, Brazil	−10.7828°	−065.3394°	Nogueira et al. 2019
Drepanoides anomalus	Municipality of Claudia, state of Mato Grosso, Brazil	−11.4462°	−055.0494°	Nogueira et al. 2019
Drepanoides anomalus	Municipality of Brasnorte, state of Mato Grosso, Brazil	−12.4251°	−057.9950°	Nogueira et al. 2019
Drepanoides anomalus	La Paz, Iturralde, Ixiamas, Serrania Tequeje, Bolivia	−13.7167°	−068.2167°	Nogueira et al. 2019
Drepanoides anomalus	La Paz, Franz Tamayo, Apolo, Chalalan, Bolivia	−14.4246°	−067.9207°	Nogueira et al. 2019
Drepanoides anomalus	Santa Cruz, Velasco, San Ignacio, Bolivia	−14.75°	−061.00°	Nogueira et al. 2019
Drepanoides anomalus	Municipality of Vale de São Domingos, state of Mato Grosso, Brazil	−15.0725°	−058.5744°	Nogueira et al. 2019

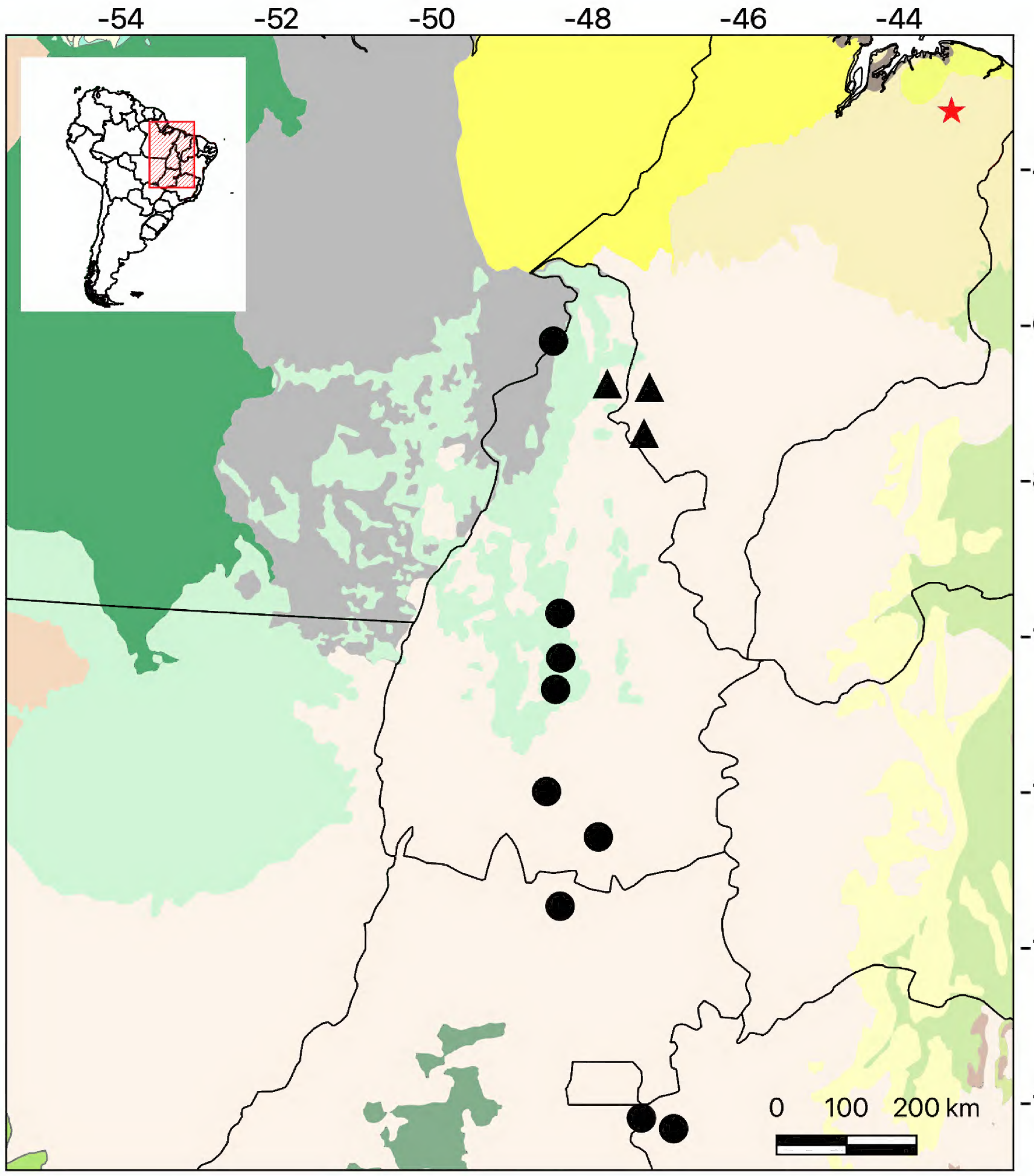

Figure 1. Distribution of *Trilepida fuliginosa* in Brazil (MPEG 21523). Symbols: black circles: literature records; black triangle mark: literature records from Prudente et al. (2019), with identification not confirmed by TBG; red star: new record in Santo Amaro Farm, municipality of Urbano Santos, state of Maranhão (MPEG 21523). Ecoregions with point occurrence according to Dinerstein et al. (2017): ☐ Maranhão Babaçu forests; ☐ Cerrado; ☐ Mato Grosso tropical dry forests; ☐ Xingú-Tocantins-Araguaia moist forest.

043.4164°W; 41 m a.s.l.; 08 Feb. 2003; Cláudia M. Maia & Fabrícia L. Brito leg.; MPEG 21523.

Identification. We identified the specimen (MPEG 21523; Fig. 2) following Passos et al. (2006), based on the diagnostic characters: 14 midbody rows; 10 midtail rows; 207 middorsal scales (excluding the caudal spine); 188 midventral scales; 14 subcaudal scales (excluding the caudal spine); 2+1 supralabials, no supralabials contacting supraocular; 5 infralabials. The color in preservative along seven dorsal scale rows is dark brown; ventrally, the specimen is cream-colored along the other seven scale rows. The lower portion of the rostral scale and supralabial border is cream-colored. Our photographs, and the pholidosis of the specimen, were also verified by Roberta R. Pinto who confirmed the identification.

***Drepanoides anomalus* (Jan, 1863)**
Figures 3, 4

New record. Material examined. BRAZIL • 1 ♀, 468 mm SVL, 137 mm CL, TL/CL 4.61; state of Maranhão, Carolina, Estreito hydroeletric plant; 07.1588°S, 047.7241°W; 167 m a.s.l.; 22 Sept. 2009; Carlos E.D. Cintra. leg. (field number: EDR 456); MPEG 24157.

Identification. We identified the specimen (MPEG 24157; Fig. 4) following Peracca (1896) and Peters and Orejas-Miranda (1970), based on the diagnostic characters:

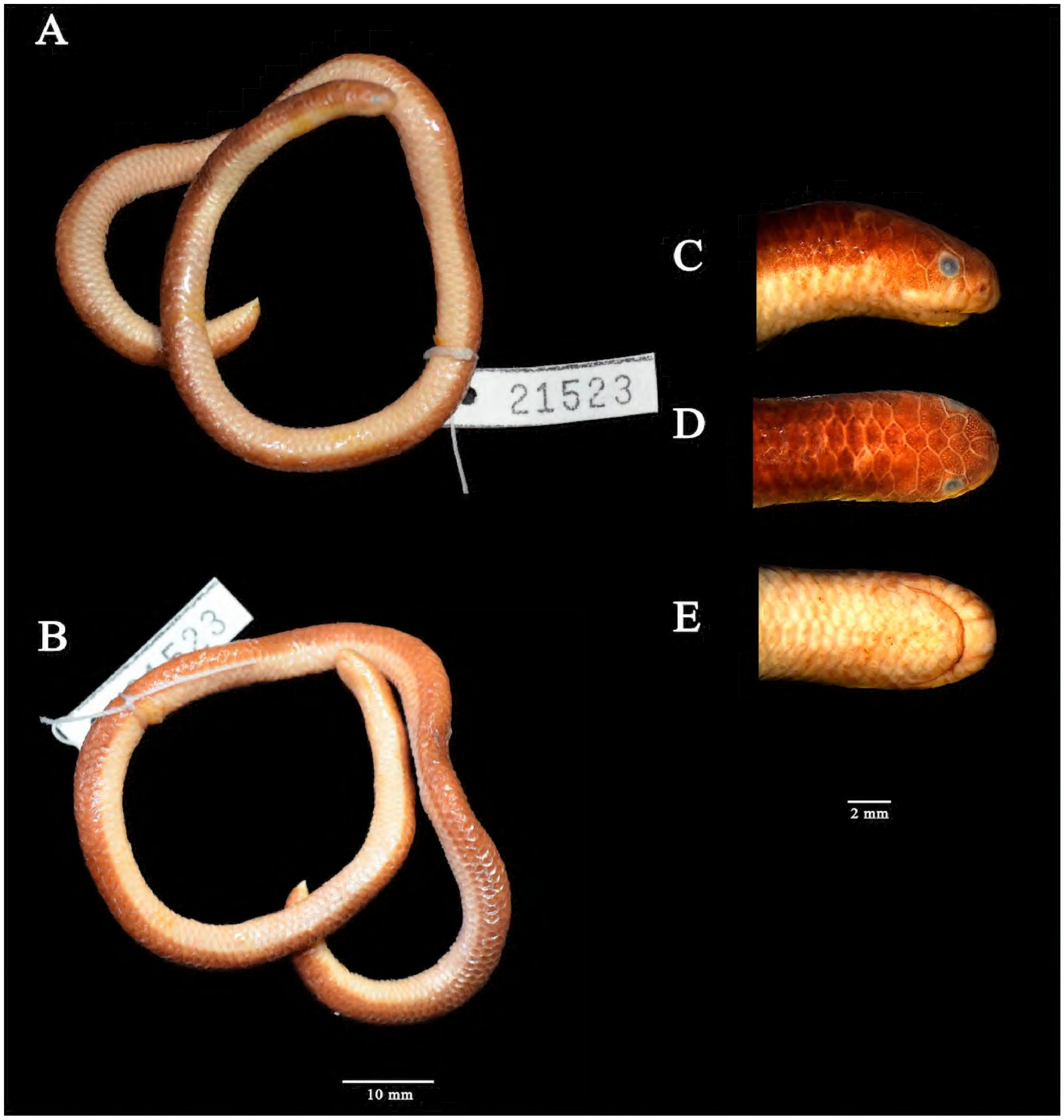

Figure 2. *Trilepida fuliginosa* (MPEG 21523). **A.** Dorsal view of the body. **B.** Ventral view of the body. **C.** Lateral head view. **D.** Dorsal head view. **E.** Gular region view. Photographs by TBG.

dorsal smooth in 15-15-15 rows; 170 ventral scales; 72 paired subcaudals; cloacal scale single; seven supralabials on both sides of the head with the third and fourth supralabial scales contacting the orbit; seven infralabials on both sides, first to fourth contacting the first pair of chin shields, fourth contacting the second pair of chin shields, first chin shield length 3.69 mm, second chin shield length 2.66 mm, temporals 2+2, one preocular and two postoculars on both sides of the head, loreal plate absent, jaw tooth with no trace of closed canal (aglyphous), and head length, width and height 17.61 mm, 10.64 mm, and 7.47 mm, respectively. After preservation in 70% ethanol, the head is black except on the border of supralabials, which is cream-colored; neck with an irregular white-collar one scale long, followed by a black collar eight scales long; gular region uniformly cream-colored; dorsum beige with small spots in the posterior portion of each dorsal scale; ventrum uniformly cream-colored.

Discussion

The material examined herein represent the first records of *Trilepida fuliginosa* and *Drepanoides anomalus* in Maranhão. The specimen of *T. fuliginosa* came from the open landscapes of the Maranhão Babaçu Forests ecoregion (according to Dinerstein et al. 2017) and the Cerrado biome according to IBGE (2019b). This record represents the northernmost documented locality for this species, nearly 662 km in a straight line from the

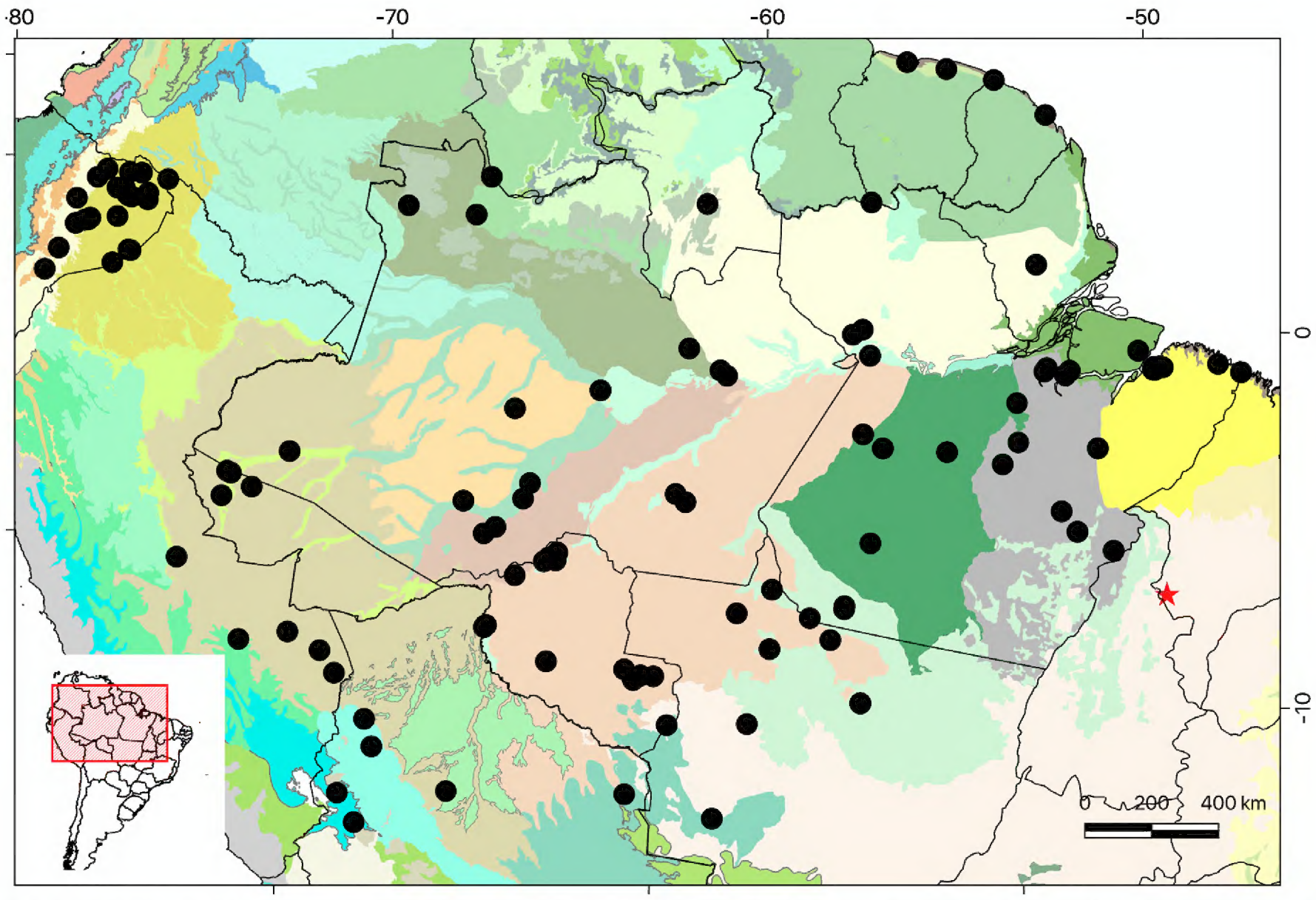

Figure 3. Distribution of *Drepanoides anomalus* in Brazil (MPEG 24157). Symbols: black circles: literature records; black question mark: literature records but with identification of the species not confirmed; red star: new record in Municipality of Carolina, Estreito Hydroelectric Plant, state of Maranhão (MPEG 21523). Ecoregions with point occurrence according to Dinerstein et al. (2017): Tocantins-Pindaré moist Forest; Cerrado; Xingú-Tocantins-Araguaia moist forest; Tapajós-Xingú moist forest; Mato Grosso tropical dry forest; Madeira-Tapajós moist forest; Uatumã-Trombetas moist forest; Purus-Madeira moist forest; Jurus-Purus moist forest; Southwest Amazon moist forest; Central Andean wet Puna; Napo moist forest; Eastern Cordillera real montane forest; Amazon-Orinoco Southeastern Caribbean mangroves.

nearest previously known occurrence at São Geraldo do Araguaia, Pará. The specimen of *D. anomalus* also came from the open landscapes of the Cerrado biome (Dinerstein et al. 2017; IBGE 2019b) and is the easternmost occurrence of the species. This specimen was misidentified and was previously reported as *Phalotris labiomaculatus* by Hamdan et al. (2013). The record presented here extends the distribution of *D. anomalus* by 203 km from Piçarra, Pará.

Both new occurrences are within areas in southern Maranhão that are under strong anthropogenic threat due to deforestation (Myer et al. 2000; Mittermeier et al. 2005). This area in southern Maranhão is recognized as a priority for biodiversity conservation, especially for amphibians and reptiles (MMA 2007).

The new records suggest that these species are more widely distributed than previously thought. The fact that these species are just now being recorded in Maranhão reinforces the lack of herpetological research and researchers in the state. Approximately 103 species of snakes are estimated to occur in Maranhão (Costa and Bérnils 2018; Guedes et al. 2018). Of these, only six species are scolecophidian snakes belonging to three families that are undersampled and poorly known in the Neotropics (Guedes et al. 2018). On the other hand, the family Dipsadidae is the most species-rich in Brazil, and in Maranhão there are approximately 45 species (Guedes et al. 2018; Costa and Bérnils 2018).

Scolecophidian bring together the thinnest and smallest species of snakes with complex taxonomy (Passos et al. 2006; Centeno et al. 2010; Graboski et al. 2015). One species of the family Anomalepididae [(*Liotyphlops ternetzii* (Boulenger, 1896)], three species of Typhlopidae [(*Amerotyphlops brongersmianus* (Vanzolini, 1976), *A. paucisquamus* (Dixon & Hendricks, 1979), and *A. reticulatus* (Linnaeus, 1758)], and two species of Leptotyphlopidae (*Trilepida brasiliensis* and *T. fuliginosa*) occur in Maranhão (Guedes et al. 2018; Costa and Bérnils 2018; this study). *Trilepida fuliginosa* is distinguished from all species of Typhlopidae and Anomalepididae in Maranhão in having 14 midbody rows (versus 16 in *A. brongersmianus*, 18 in *A. paucisquamus* and *A. reticulatus*, and 22–24 in *L. ternetzii*) (Centeno et al. 2010; Graboski et al. 2015); *T. fuliginosa* differs from *T. brasiliensis* in having a supraocular scale (versus absent in *T. brasiliensis*) and in the absence of fused caudals on the tip of the tail (versus present in *T. brasiliensis*) (Pinto and Curcio 2011).

Only two species in the Maranhão, *Apostolepis cearensis* Gomes, 1915 and *Phalotris labiomaculatus* Lema, 2002, are similar to *D. anomalus* in their pholidosis (15-15-15) and general color pattern in preservative.

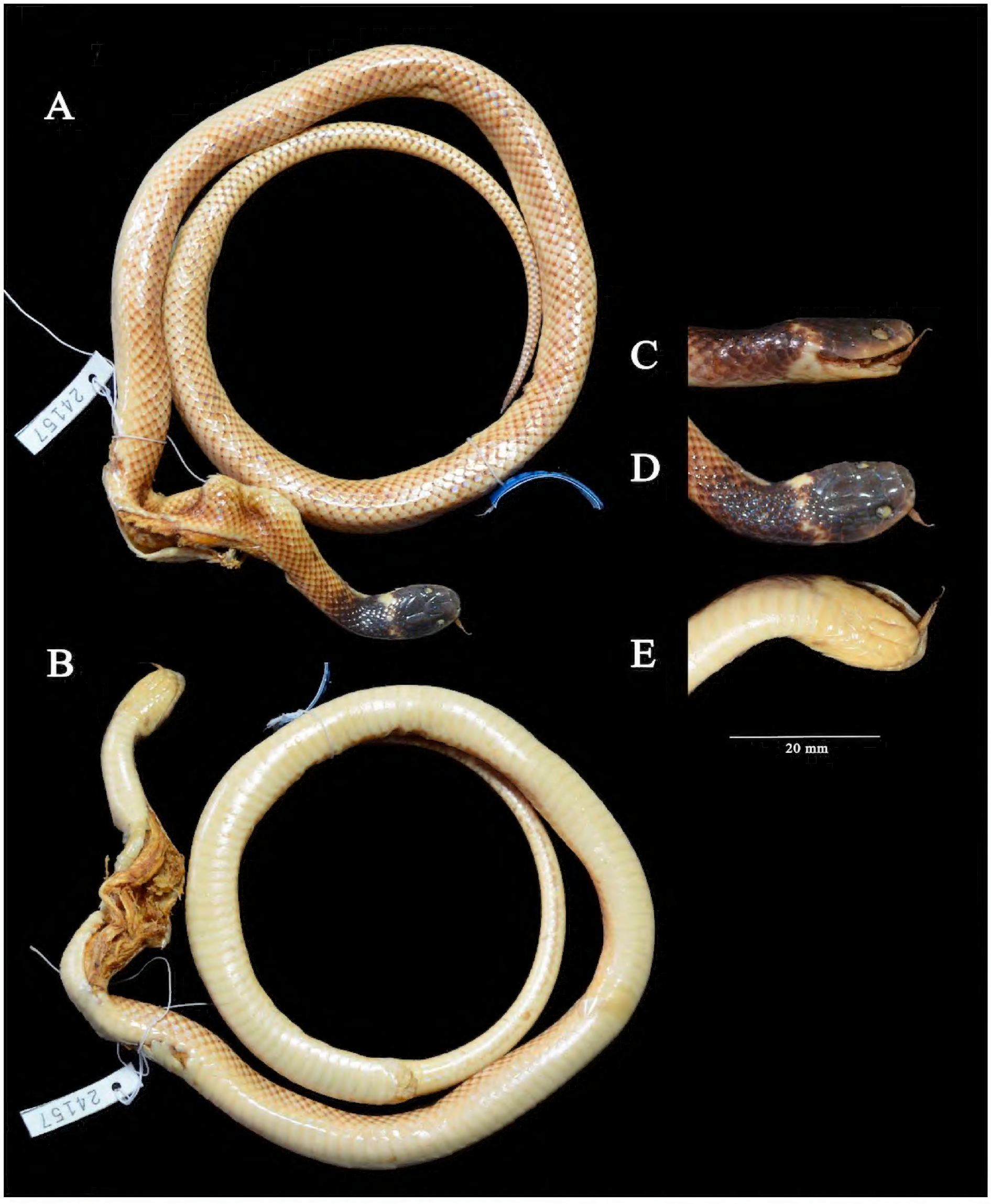

Figure 4. *Drepanoides anomalus* (MPEG 24157). **A.** Dorsal view of the body. **B.** Ventral view of the body. **C.** Lateral head view. **D.** Dorsal head view. **E.** Gular region view. Photographs by TBG.

Drepanoides anomalus differ from both in having no sulcate jaw tooth (aglyphous) versus opistoglyphous dentition of the others (Peters and Orejas-Miranda 1970). The tip of the tail in *Apostolepis cearensis* is black, and, along with *P. labiomaculatus*, the eye is reduced; both characteristics are absent in *D. anomalus* (Peters and Orejas-Miranda 1970; Hamdan et al. 2013).

Considering the scarcity of information on the snake fauna in the north-central Brazil, these new records show the importance of natural history collections in preserving biodiversity data. Occurrence records are basis for understanding distribution patterns of the Earth's biodiversity over time. The publication of new distributional records can and provide quality data to update species' geographic ranges, assess phylogenetic diversity and endemism, and contribute knowledge that can identify areas of priority for conservation (Guedes et al. 2018; Azevedo et al. 2020).

The natural landscapes of Maranhão has been strongly transformed by the expansion of agropastoral activities and an increase in human-caused forest fires (INPE 2019). New information on the composition and distributions of species can contribute to regional strategies for biological conservation, and our results are part of an ongoing project to gather information on the snake fauna and its distribution in Maranhão.

Acknowledgements

We are grateful to Ana Lucia Prudente for allowing access to the specimens housed in the herpetological collection of the Museu Paraense Emílio Goeldi. We thank João Fabrício Sarmento and Jéssica San Martin for their assistance during the examination and photographing of the specimens. TBG thanks the Universidade Estadual do Maranhão for the Senior Researcher fellowship. AQ thanks the Fundação de Amparo à Pesquisa e ao Desenvolvimento Científico e Tecnológico do Maranhão. PS thanks the Universidade Estadual do Maranhão for the master's degree scholarship. B.H. thanks the Instituto Vital Brazil and Conselho Nacional de Desenvolvimento Científico e Tecnológico for the financial support.

Authors' Contributions

TBG examined the specimens, wrote the draft, and the figures and table; AQ and PS performed a review of the literature for occurrence data; BH assisted TBG in the whole process, especially in the preparation of the figures and the draft of the manuscript; BH assisted TBG with the identification; all authors revised the manuscript.

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